Trade, Food Standards and Poverty: The Case of High-Value Vegetable Exports from Senegal

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1. Introduction

The structure of world agricultural trade has changed substantially since the 1980s with fresh food products such as FFV (fresh fruit and vegetables) gaining importance. These high-value commodities now account for half of all agro-food exports from developing countries to high-income countries (Unnevehr, 2000) and become important in the growing high-value urban markets within developing countries. Participation in high-value domestic and international agricultural markets is advocated as a major potential engine for economic growth and global poverty reduction. Especially high-value horticulture trade is sometimes mentioned to have a high potential for reducing poverty and benefiting local development because of the link to the rural economy and its intensive use of land and unskilled labour. At the same time it is argued that increasingly stringent food quality and safety standards act as barriers to trade and diminish the export opportunities of developing countries. Moreover, some studies argue that the benefits in high-value and high-standards food supply chains are extracted by multinational companies and developing countries elites, and that small and poor farmers are likely to be excluded from these supply chains and the benefits thereof (e.g. Dolan and Humphrey, 2000; Farina and Reardon, 2000). Other authors provide evidence that small farmers are included and do gain from high-value agricultural production and trade (e.g. Minten et al., 2006; Minot and Ngigi, 2004). The degree to which small farmers participate in and benefit from high-value agricultural production and trade is likely influenced by recent developments in global value chains, such as increased vertical coordination and increased pervasive

food standards. This is a particularly important issue on which empirical evidence is scarce and contentious.

In this paper we analyse supply chain developments and the effects for small farmers for the case of horticulture production – French beans in particular – and export in Senegal.

2. Study area and data collection

Our study uses a unique dataset derived from interviews and surveys at different levels of the FFV export supply chain in *Les Niayes* – the main horticulture zone in Senegal from which the majority of exported French beans originate. Next to green bean production for export, the majority of households in this region are horticulture farmers producing a large variety of vegetables for the local market. In April 2005 we conducted interviews with nine of the 20 FFV exporting companies who jointly represent 44% of the exported volume French beans. From these interviews we obtained qualitative information on the developments in the export supply chain and some quantitative firm information In the period August – September 2005 we implemented a household survey covering 300 households in 25 randomly selected villages in the research region. The sample was stratified on whether or not households produce French beans on contract with an exporting firm and sampling weights are used to draw correct inferences. The data were further complemented with secondary statistics, mainly gathered from DH *Direction de l'Horticulture,* and with interview-information from some key horticulture institutions, including SEPAS (Syndicat des Exportateurs des produits Agricoles), ONAPES (Organisation National des Producteurs Exportateurs de Fruits et Légumes

de Sénégal) – two professional organizations of horticulture exporters – and CDH (Centre pour le Développement de l'Horticulture) – a horticulture research centre.

This unique dataset allows us to explain how the FFV export supply chain in Senegal has changed under pressure of changing food standards and specifically assess the impact of these changes for the local farmer population. To do so, we use a comprehensive regression model.

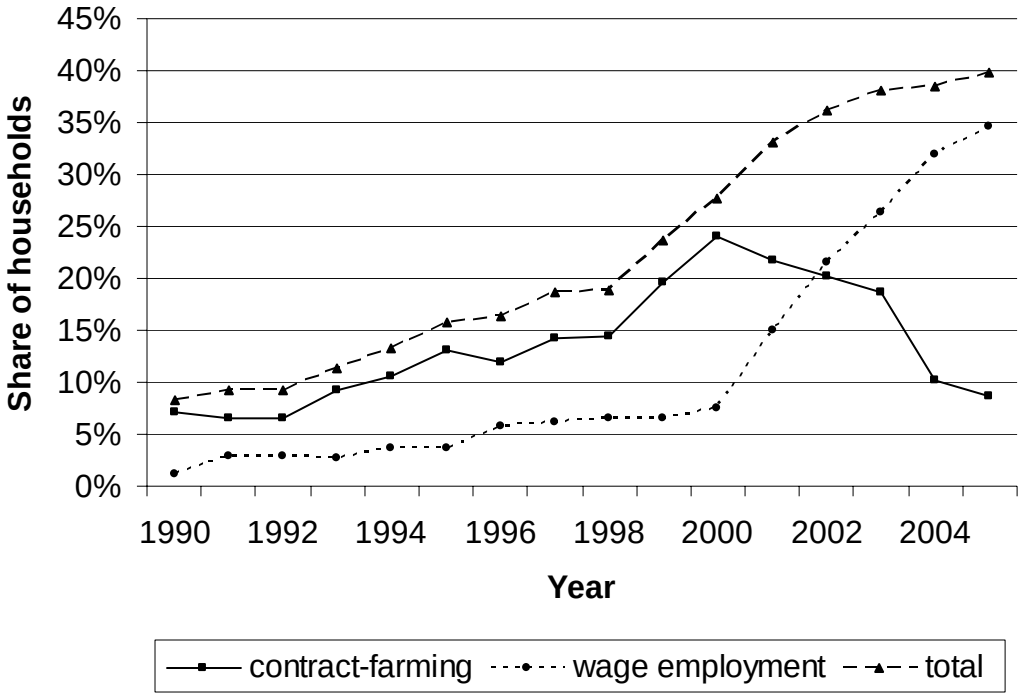
3. Food standards and supply chain restructuring

Exports of FFV from Senegal almost tripled since the devaluation of the FCFA in 1994. The export of French beans in particular has slowed down after a period of rapid growth at the end of the 1990s and now still represents 42% of the volume FFV exports. French beans are mainly exported to the EU where public and private standards concerning food quality and food safety are increasingly pervasive. These standards put pressure on FFV exporters in Senegal to stay up to date with the changing legislation and make additional investment to comply with stringent food standards and become certified – e.g. HACCP and EurepGAP certification. This has lead to a consolidation in the sector with smaller exporters leaving the market because they face financial constraints to realize high-standards production and trade. To guarantee food quality and safety throughout the supply chain, exporting firms – especially larger firms – increasingly rely on tighter vertical coordination with upstream suppliers of primary produce. This brought about structural changes in the FFV export supply chain, which resulted in a shift from contract-farming with small-scale producers to large-scale vertically integrated estate-farming within exporting companies. Some firms in our sample changed their procurement system from 100% reliance on contract-farming with smallholders to up to 80% reliance on vertically

integrated production on bought or rented land. This supply chain restructuring has changed the role of small farmers and rural households in the value chain; with important welfare implications.

Household survey data reveal that there has been a dramatic increase in the overall participation of local households in the French bean export supply chain, from less than 10 % in 1992 to about 40 % in 2005 (figure 1).

Figure 1: Share of households participating in French bean production through wage employment or contract-farming



The figure is based on recall data from a sample of 300 households in 2005. To account for demographic effects, households for which the household head did not reach the age of 25 in a particular year and households who migrated to the area only after a particular year were excluded from the figures for that year. To account for biases due to sampling design, sampling weights were used in the calculations.

Source: Calculated from survey data

During the second half of the 1990s – when the export of French beans was growing rapidly – households increasingly participated in export production through contract-

farming. In 2000, an estimated 24 % of local households produced French beans on contract with an exporting firm. From 2000 onwards, household participation grew further – despite a slowdown in export growth – through wage employment in the agro-industry while contract-farming decreased. As a result of increased estate production, employment in the French bean agro-industry has increased from less than 10 % of local households in 2000 to 35 % in 2005. However, stringent food standards and subsequent changes in procurement system of agro-exporting firms lead to a sharp decrease in the share of households producing French beans on contract; from 24 % in 2000 to 8.5 % in 2005. Participation of rural households in high-standards FFV production has increased substantially but their role is shifting from contract-farmers to estate wage workers.

4. Econometric analysis and results

An econometric analysis using a treatment effects model with a categorical treatment variable and selectivity correction based on a multinominal logit model allows us to derive the welfare effects of the structural changes in the French bean export supply chain. The results are given in table 1 (first stage results of a multinominal logit model explaining the participation of households in contract-farming and in wage employment on FFV estate farms) and in table 2 (second stage results of an OLS model corrected for selectivity bias explaining the impact on household income). The robustness of the results is verified through comparing the estimates with those obtained from two binary treatment effects models, which are not reported here.

The results of the first stage multinominal logit model reveal that contract-farming is biased to better-off (albeit still small) farmers with more land, a higher

share of irrigated land and more productive assets while wage employment on FFV estates is undertaken by rather poorer, larger and lower educated households. The results of the second stage estimation demonstrate that both French bean contract-farming and wage employment on agro-industrial estates add to rural incomes but that the effect of contract-farming is significantly higher. Contract-farmers and estate workers have incomes that are respectively 3 million and 1.4 million FCFA[1] higher than non-participating households.

Table 1: Explaining participation: 1st stage regression results from a multinominal logit model

			Number of obs	297
			F(16, 280)	3.7200
			Prob > F	0.0000
Variables	Coefficient	odds ratio	Std. Err.	t statistic
AGRO-INDUSTRIAL EMPLOYMENT (*m*=1)				
land	0.0059	1.0059	0.0351	0.17
irrigation	0.0006	1.0006	0.0038	0.16
livestock	-0.0386	0.9622	0.0476	-0.81
eq._agr	-0.0004	0.9996	0.0007	-0.5
eq._nonagr.	-0.0018	0.9982	0.0009	-2.03**
labour	0.2271	1.2549	0.0500	4.54***
education	-0.4470	0.6396	0.3255	-1.37
region	0.8368	2.3090	0.3250	2.57***
constant	-2.4741		0.5825	-4.25
CONTRACT_FARMING (*m*=2)				
land	0.0856	1.0894	0.0287	2.98***
irrigation	0.0116	1.0117	0.0055	2.13**
livestock	0.0236	1.0238	0.0257	0.92
eq._agr	0.0006	1.0006	0.0006	0.96
eq._nonagr.	-0.0003	0.9997	0.0006	-0.57
labour	0.1367	1.1465	0.0605	2.26**
education	-0.0308	0.9696	0.3813	-0.08
region	0.9932	2.7000	0.3815	2.6***
constant	-5.0504		0.6989	-7.23

Significance level: *** 1%; ** 5%; *10%; and ° 15%

The outcome no participation (*m*=0) is used as the basecategory; the estimated coefficients of the other outcomes (*m*=1 and *m*=2) have to be interpreted relative to the basecaterory

Source: Author survey

[1] FCFA – Franc de la Communauté Française d'Afrique – is the currency of the West-African Economic and Monetary Union – and is pegged to the Euro at an exchange rate of 655.49 FCFA/Eur

Table 2: Impact of participation on income: 2nd stage regression results from an OLS regression

Number of obs	297
F(16, 280)	23.24
Prob > F	0
R-squared	0.2626

Variables	Coefficient	OLS estiamtes		Bootstrap estimates[1]	
		Std. Err.	t statistic	Std. Err.	t statistic
unearned income	0.926	0.051	18.01***	0.405	2.28**
land	325.6	171.8	1.89*	45.94	7.09***
irrigation	22.61	14.30	1.58°	3.572	6.33***
eq._agr	3.925	3.825	1.03	1.300	3.02**
eq._nonagr	3.722	4.512	0.82	2.088	1.78*
livestock	-35.85	178.7	-0.20	47.38	-0.76
labour	887.0	557.3	1.59°	197.9	4.48***
labour^2	-57.26	36.65	-1.56°	12.04	-4.76***
m_1 (wage employment)	1,419	827.5	1.72*	269.8	5.26***
m_2 (contract-farming)	3,051	1,257	2.43**	221.9	13.75***
corr_funct_m_1	16,868	22,165	0.76	8,653	1.95*
corr_funct_m_2	-11,360	31,964	-0.36	14,350	-0.79
corr_funct_m_3	6,778	8,952	0.76	2,789	2.43**
corr_funct_m_{12}	43,205	94,805	0.46	40,512	1.07
corr_funct_m_{13}	-4,481	50,383	-0.09	17,080	-0.26
corr_funct_m_{23}	-5,952	62,903	-0.09	25,145	-0.24
constant	-738.2	125,602	-0.01	51,870	-0.01

Significance level: *** 1%; ** 5%; *10%; and ° 15%

Note: the selectivity correction functions, corr_func_m_x, to account for self-selection bias of treatment m=0, 1, 2 were calculated from a multinomnial logit model.

[1] To account for the two-step nature of the procedure, standard errors are estimated using the bootstrap method with 50 bootstrap replications and bootstrap samples seleceted within each stratum of the original survey design.

Source: Author survey

Wage employment on agro-industrial FFV estates adds to the incomes of the poorest households while FFV contract-farming benefits relatively better-off households. This implies that not only more households but also more poor households benefit from high-value FFV production and that hence the distribution of rents among the rural population in this high-value chain is more equitable than is was in 2000 – before supply chain restructuring took place. On the other hand numerous farmers faced substantial income losses due to the dissolution of their contract.

Overall welfare effects of the shift from contract-farming to estate-farming are complex. The share of rents from high-value FFV production that accrues to the rural population might have decreased – in favor of a higher share for the agro-industry – but the benefits are more equally distributed among the rural population. Many studies on the impact of high-value agriculture implicitly assume that small farmers need to be integrated as contracted suppliers in high-value agricultural supply chains if these need to be welfare enhancing and support rural development. Our findings provide evidence that this is not necessarily the case and that expansion of high-value agricultural trade significantly contributes to enhanced welfare and poverty-alleviation if it is realized through estate-farming and associated rural employment.

5. Discussion and implications

Our study reveals a number of important findings. First, the increasing importance of food standards has driven a shift away from contract-farming with smallholders towards vertically integrated estate-farming. Similar observations have been made for other countries and other sectors (e.g. Minot and Ngigi, 2004; Dolan and Humphrey, 2000). Second, contract-farming for high-value FFV exports is biased towards relatively better-off rural households. This result empirically validates the often heard argument in the literature that the smallest and poorest farmers are excluded from contract-farming and the benefits thereof (e.g. Reardon et al., 1999; Farina and Reardon, 2000; Key and Runsten, 1999). Third, rural households integrated in high-value production through contracts with agro-exporting firms obtain substantial income gains from these contracts. This is a key issue as contract-farming has been criticized as being a tool for agro-industrial firms and food multinationals to exploit unequal relationships with farmers and extract rents from the chain (Warning and

Key, 2002). Our case-study adds to other recent empirical studies providing evidence of the beneficial effect of contract-farming (e.g. Minten et al., 2006; Swinnen, 2005). Fourth, rural households integrated in high-value production through wage employment on agro-industrial estates also reap significant income gains from such employment. Many studies on the impact of high-value agriculture implicitly assume that small farmers need to be integrated as contracted suppliers in high-value agricultural supply chains if these need to be welfare enhancing and support rural development. Our findings provide evidence that this is not necessarily the case and that expansion of high-value agricultural trade significantly contributes to enhanced welfare even if it is realized through estate-farming and associated rural employment. Fifth, mainly poorer households are integrated in high-value production through wage employment on agro-industrial estate farms. This signifies that the benefits from high-value production are more likely to add to the incomes of the poorest households if it is realized through estate-farming rather then through contract-farming that is biased to relatively better-off households. In a study on Kenyan export horticulture Humphrey, Mc Culloh and Ota (2004) argue – based on a simulation model – that a shift away from smallholder production is likely to contribute to an enhanced poverty-reducing impact of high-value agricultural trade. In this paper we have presented evidence for this argument.

The findings of our study imply that high-standards agricultural trade is an engine of pro-poor economic growth in developing countries and that a dualistic structure in high-standards supply chains – with smallholder contract-farming and large-scale integrated estate-farming, and with small farmers integrated as suppliers and as wage workers – is most likely to bring about a balanced development impact with both equity and efficiency concerns addressed.

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